

## THE CLAIMS

What is claimed is:

1. A golf ball comprising:

5           a center formed of a reaction product having a dynamic stiffness of less than about  
50,000 N/m at -50°C comprising:  
polybutadiene having a molecular weight of greater than about 200,000;  
a crosslinking material present in an amount of about 10 to about 40 parts per  
hundred of the reaction product;  
10           a free radical source present in an amount of about 0.1 to about 15 parts per  
hundred of the reaction product;  
a cis-to-trans catalyst present in an amount of about 0.1 to about 10 parts per  
hundred of the reaction product; and  
a cover comprising a thermoplastic or thermoset polyurethane.

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2. The golf ball of claim 1, wherein the dynamic stiffness is about 10,000 N/m to about 40,000 N/m at -50°C.

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3. The golf ball of claim 2, wherein the dynamic stiffness is about 20,000 N/m to about 30,000 N/m at -50°C.

4. The golf ball of claim 1, wherein the molecular weight of the polybutadiene is greater than about 250,000.

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5. The golf ball of claim 4, wherein the molecular weight of the polybutadiene is from about 300,000 to about 500,000.

6. The golf ball of claim 1, wherein the cis-to-trans catalyst comprises at least one of an organosulfur compound, an aromatic organic compound, or a mixture thereof.

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7. The golf ball of claim 6, wherein the organosulfur compound comprises metal.
8. The golf ball of claim 6, wherein the organosulfur compound comprises less than about 3 weight percent metal.

9. The golf ball of claim 8, wherein the organosulfur compound comprises less than about 0.01 weight percent metal.
- 5 10. The golf ball of claim 6, wherein the aromatic organic compound is substantially free of metal.
- 10 11. The golf ball of claim 6, wherein the aromatic organic compound comprises a hydroxy group, a metal salt of a hydroxyl, a mercapto group, a metal salt of a mercapto group, a carboxy group, a metal salt of a carboxyl, an acrylate, a metal salt of an acrylate, or a combination thereof.
12. A golf ball comprising:  
a center formed of a reaction product comprising:  
15 polybutadiene having a molecular weight of greater than about 200,000;  
a crosslinking material present in an amount of about 10 to about 40 parts per hundred of the reaction product;  
a free radical source present in an amount of about 0.1 to about 15 parts per hundred of the reaction product;  
20 a cis-to-trans catalyst present in an amount of about 0.1 to about 10 parts per hundred of the reaction product, wherein the reaction product has a percent change in dynamic stiffness from 0°C to -50°C of less than 20 percent; and  
a cover comprising a thermoplastic or thermoset polyurethane.
- 25 13. The golf ball of claim 12, wherein the molecular weight of the polybutadiene is about 250,000 or greater.
14. The golf ball of claim 13, wherein the molecular weight of the polybutadiene is about 300,000 to about 500,000.
- 30 15. The golf ball of claim 12, wherein the crosslinking material is present in an amount of about 10 to about 30 parts per hundred of the reaction product.

16. The golf ball of claim 12, wherein the free radical comprise a peroxide present in an amount of about 0.2 to about 5 parts per hundred of the reaction product.

17. The golf ball of claim 12, wherein the cis-to-trans catalyst is present in an amount of about 0.1 to about 8 parts per hundred of the reaction product.

18. A golf ball comprising:

a center formed of a reaction product having a dynamic stiffness of less than about 50,000 N/m at -50°C and a percent change in dynamic stiffness from 0°C to -50°C of less than 20 percent, wherein the reaction product comprises:  
polybutadiene having a molecular weight of greater than about 200,000;  
a crosslinking material present in an amount of about 10 to about 40 parts per hundred of the reaction product;  
a free radical source present in an amount of about 0.1 to about 15 parts per hundred of the reaction product;  
a cis-to-trans catalyst present in an amount of about 0.1 to about 10 parts per hundred of the reaction product; and  
a cover comprising a castable reactive liquid material.

19. The golf ball of claim 18, wherein the dynamic stiffness is about 10,000 N/m to about 40,000 N/m at -50°C.

20. The golf ball of claim 19, wherein the dynamic stiffness is about 20,000 N/m to about 30,000 N/m at -50°C.

21. The golf ball of claim 18, wherein the castable reactive liquid material comprises polyurethane.